

REMARKS

Claims 13-17, 19 and 21-24 were rejected under 35 USC §103(a) as being unpatentable over ASSARSSON et al. 3,901,236 in view of SMITH 5,328,939. The Official Action states that the patented reference discloses all aspects of the claimed invention but remains silent as to the method of crosslinking the superabsorbent material. This patented reference describes hydrogel composites having improved aqueous fluid absorption. These hydrogel composites comprise hydrogel particles which are fully or partially covered by fibers (column 2, lines 3-9). The Official Action states that ASSARSSON et al. thus describes an absorbent structure, that is, a hydrogel composite in column 1, lines 10-11, which comprises a porous material (fiber) and a superabsorbent material (hydrogel). This primary reference also indicates that the composites contain hydrogel and fiber in a ratio of at least 50% w/w (column 5, lines 22-24). The hydrogel composites may be used in absorbent articles such as diapers or incontinent pads (column 7, lines 64-67). The patentees state that a wide variety of hydrogels may be used in column 3, lines 33-35, and mention organic compounds such as polymers which are crosslinked by covalent, ionic, Van der Waals forces or hydrogen bonding. The patent includes a long list of polymers which can be employed as hydrogels.

The secondary reference to SMITH describes new rigid materials which have a high surface area and low density. Among

other uses for these materials, SMITH mentions "absorbents" in column 2, line 54. The material is produced by crosslinking a nitrogen-containing polymer with an anionic salt and further crosslinking with a covalent crosslinking agent. The patentee mentions the use of various metal salts, such as sodium, potassium, copper, magnesium calcium, barium, zinc, cadmium, aluminum, iron, cobalt and nickel salts among a large list of potential ionic crosslinking agents with tripolyphosphate salts being preferred.

The Official Action concludes that it would have been obvious to one of ordinary skill in the art to have combined the teachings of ASSARSSON et al. with those of SMITH, to produce the superabsorbent showing strength and stability.

Reconsideration of the above rejection is respectfully requested for the following reasons.

It is respectfully submitted that the Official Action has misrepresented the object of the present invention. Indeed, as is stated in the paragraph bridging pages 3 and 4 of this application, the object of the present invention is to provide "an absorbent structure which contains a high amount of absorbent material...having improved properties with respect to liquid acquisition capacity and distribution capacity at repeated wettings." Evidence that the materials of the present invention have such properties is provided in the examples and figures of the specification. The desired properties are achieved by the

absorbent structure containing at least 50% by weight of superabsorbing material, the superabsorbing material being initially crosslinked by ionic bonds with an ionic crosslinking agent comprising a polyvalent metal ion. These ionic bonds purportedly allow the superabsorbent material to maintain its gel stability after swelling, as the bonds can be redistributed and regenerated as the polymers swell.

It is respectfully pointed out that the primary reference to ASSARSSON et al. makes no reference to producing an absorbent structure with high distribution capacity at repeated wettings. Moreover, there is no indication whatsoever, that an absorbent structure with high liquid acquisition capacities and distribution capacities at repeated wettings can be achieved by an absorbent structure, which is initially crosslinked with ionic bonds with a crosslinking agent comprising a polyvalent metal ion, as is currently recited in independent claim 13.

The use of ionic bonds to crosslink polymers appears in a list of almost all possible bonding interactions which might exist between polymers, and there is no clue, reason, motivation or suggestion that the use of this specific crosslinking technique, in preference to any other techniques, might lead to improved properties of a superabsorbent material with respect to its liquid acquisition capacity and distribution capacity at repeated wettings.

The problem solved by the present invention, which problem is part and parcel of the subject matter as a whole within the meaning of 35 USC §103, is the use of superabsorbent materials in absorbent structures causes gel blocking. The gel blocking phenomenon means that the superabsorbent material when wetted forms a gel which blocks the pores in the fiber structure and consequently deteriorates the liquid transport away from the wetting area to the other parts of the absorbent structure. This gel blocking causes significant problems especially at repeated wettings, since by then the already-swollen superabsorbent blocks the new liquid from being received and spread in the absorbent structure. This problem is accentuated when the absorbent structure contains high concentrations of superabsorbent material. In order to provide an absorbent article that is comfortable and discrete to wear, it is desirable that the article be thin. In order to maintain a high liquid absorption capacity, such thin products often have a high amount of superabsorbent material.

Applicant has discovered that ionically crosslinked superabsorbents used in high amounts (at least 50 weight %) in absorbent structures lead to improved properties of the structure with respect to liquid acquisition capacity, and distribution capacity at repeated wettings, as compared to a superabsorbent which is covalently crosslinked. This discovery is substantiated

by the comparative tests presented in the original specification, and depicted in the drawings.

It is respectfully submitted that the primary reference to ASSARSSON et al. contains absolutely no teaching which would lead a person having ordinary skill in the art to the solution provided by the herein-claimed invention.

The secondary reference to SMITH provides novel rigid materials which have a high surface area and low density, but makes no mention of "superabsorbent materials". This reference uses the absorption of nitrogen gas by these materials to measure surface area (see column 6, line 65), but is silent with regard to the extent of the absorption of liquids. Moreover, SMITH makes no reference to the goals achieved by the present invention, namely producing an absorbent structure with high liquid acquisition capacities and distribution capacities at repeated wettings. In addition, the fact that the materials described by SMITH are rigid makes them unsuitable for use in the herein-claimed invention. Indeed, the absorbent structures of the herein-claimed invention will swell under gel formation as is explained on page 6, lines 20-26 of the specification, whereas the materials described by SMITH "exhibit low or no swellability" (see column 6, line 38).

Consequently, it is respectfully submitted that SMITH contains no teaching which would lead a person having ordinary skill in this art towards the present invention, and there is

simply no reason why such a skilled artisan would look to rigid, gas-absorbing materials to find swellable, liquid-superabsorbent materials with the desirable properties of the herein-claimed invention.

Claims 18 and 20 were rejected under 35 USC §103(a) as being unpatentable over ASSARSSON et al. in view of SMITH, as applied to claim 15 above, and further in view of HUTCHINS et al. 5,957,203. The tertiary reference to HUTCHINS et al. is relied upon as disclosing the use of aluminate ion as a cationic crosslinking agent.

Reconsideration of the above rejection is respectfully requested for the following reasons.

The tertiary reference to HUTCHINS et al. describes gel materials which are stable at high temperatures, particularly for use in the oil mining industry. Such gels are formed between a polymer comprising an acrylamide unit and a cationic unit, and a crosslinking agent. Crosslinking agents are said to include inorganic crosslinking agents, such as aluminates among others.

The gels obtained by HUTCHINS et al. have improved properties with respect to stability at high temperature (around 150°C), a feature which is irrelevant to the herein-claimed invention. The HUTCHINS et al. reference is simply silent with respect to the goals achieved by the present invention, that is providing an absorbent structure which contains a high amount of absorbent material having improved properties with respect to

liquid acquisition capacity and distribution capacity at repeated wettings. This tertiary reference is also silent with respect to the liquid absorbing properties of the gels described therein, and gives no teaching to a person skilled in the art as to how an absorbent structure which contains a high amount of absorbent material having improved properties with respect to liquid acquisition capacity and distribution capacity at repeated wettings might be achieved.

In addition, the technical field addressed by HUTCHINS et al., namely subterranean formations containing gel material during the extraction of oil or gas is so far removed from that of the herein-claimed invention, that a person having ordinary skill in the art would not consider such a document as a source of information when designing absorbent articles containing a superabsorbent material for use in, for example, diapers.

Thus, while the tertiary reference to HUTCHINS et al. may disclose the feature for which it was relied upon, it nevertheless fails to remedy the fundamental shortcomings of the basic combination of ASSARSSON et al. in view of SMITH, so as to render the herein-claimed subject matter obvious within the meaning of 35 USC §103.

In view of the present response and the foregoing remarks, therefore, it is believed that this application has been placed in condition for allowance. Reconsideration and allowance

on the basis of currently-pending claims 13-24 are accordingly solicited.

In the event that there are any questions relating to this amendment or to the application in general, it would be appreciated if the Examiner would telephone the undersigned attorney concerning such questions so that the prosecution of this application may be expedited.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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